



Master Plan

FOR
DISTRICT
SCIENCE
CENTRES




NATIONAL COUNCIL OF SCIENCE MUSEUMS
19A, GURUSADAY ROAD, CALCUTTA-700 019

A Master Plan for DISTRICT SCIENCE CENTRE



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1. GENESIS :

The Industrial & Technological Museums at Calcutta and Bangalore started the Mobile Science Exhibitions (MSE) in 1965 and 1970 respectively with the primary objective of taking the message of science to the common man in the rural areas. This effort was met with a fruitful impact on the public resulting in proposals from schools in Purulia (West Bengal) and Gulbarga (Karnataka) to start Science Centres there in order to have yearround sustained activities in and around those towns. The experimental Centre at Purulia was set up in 1968 and at Gulbarga in 1970. The exhibition halls in both the Centres comprised of twenty-four portable exhibits on particular themes and some interesting participatory exhibits on basic sciences. The portable exhibits were changed from time to time by the parent Museums. In addition there were educational extension activities such as Creative Ability Centres for students, Science Demonstration Lectures, popular scientific film shows etc. After an experimental operation over a period of about 6 to 7 years the proposal of making these experimental district centres permanent was mooted due to the keen interest evinced by the local population and the active support of the respective State Governments in giving land free of cost and also sharing the capital cost to the extent of fifty percent as well as recurring grants for conducting certain activities based on local resources and problems.

At this stage the Planning Commission of Government of India set up a Task Force on Science Museums in 1973 to consider a master plan for development of science museums in India during the fifth plan period. The Task Force considered the problems of development of Science Museums in the country in its totality and besides others recommended setting up of 20 District Science Centres (DSC) (vide Annexure 'A'). Later a Committee was constituted for suggesting a plan of implementation of Task Force recommendations. The Committee in its report suggested implementation of Task Force recommendations in phased manner (vide Annexure 'B') which however did not materialise during the Fifth Plan period due to financial and other constraints. In 1978 as per decision of Government of India an autonomous society - National Council of Science Museums (NCSM) was formed for administering the existing Science Museums under the CSIR and for taking up the development of new Museums/Centres. The Society of NCSM in its first meeting held on August 16, 1978 decided to set up 20 District Science Centres during the Sixth Plan period as recommended by the Task Force in 1974. The Governing Body of NCSM in its second meeting held on

January 18, 1979 resolved that the Chairman, Governing Body may form a Study Group to advise on the methodology of implementation of the projects with particular reference to the objectives and after evaluating the existing experimental District Science Centres at Purulia and Gulbarga.

2. STUDY GROUP :

2.1. Composition of the Study Group :

The Chairman, Governing Body, NCSM constituted a Study Group in pursuance of the decision in its meeting held on January 18, 1979 comprising of experts from various fields as below for helping NCSM to draw a Master Plan for the District Science Centres proposed to be set up.

1. Shri Kiran Karnik, Chairman
Space Applications Centre,
Ahmedabad.
2. Dr. Anil Sadgopal, Member
Kishore Bharati,
Hoshangabad.
3. Dr. Kartikeya Sarabhai, -do-
Vikram A Sarabhai Community
Science Centre,
Ahmadabad.
4. Dr. V G Kulkarni, -do-
Homi Bhaba Centre for
Science Education,
Bombay.
5. Dr. Amulya Reddy, -do-
Indian Institute of Science,
Bangalore.
6. Shri Rathindra Nath Roy, -do-
Murugappa Chettiar Research
Centre,
Tharamani,
Madras.
7. Prof. A P Srivastava, -do-
Delhi University Library System,
Delhi.

- | | | |
|-----|--|----------------|
| 8. | Dr. Santimay Chatterjee,
Variable Energy Cyclotron
Project,
Calcutta. | Member |
| 9. | Shri Bhartendu Prakash,
Vigyan Shiksha Kendra,
Banda. | -do- |
| 10. | Shri A Bose,
Chairman,
Indian National Committee
for ICOM,
Calcutta. | -do- |
| 11. | Dr. Saroj Ghose,
Director,
NCSM, Calcutta. | -do- |
| 12. | Shri R M Chakraborti,
Senior Curator,
VITM,
Bangalore. | -do- |
| 13. | Shri S K Bagchi,
Senior Curator,
BITM,
Calcutta. | Convener. |

2.2. Terms of Reference :

The terms of reference for the Study Group in respect of District Science Centre were as follows :

a) Conceptual Development : to delineate the scope and areas of activities for effective interaction of science, technology and society keeping in view the requirements of varying cross section of people in rural areas (e.g. farmers, cottage industries workers, labours, women, children, students, teachers etc.) and national priorities.

b) Infrastructure : to outline an appropriate organisational structure both for central planning at headquarters and for implementation at the district level and to assess the financial input, phasewise and yearwise.

c) Collaboration : to identify various collaborating agencies for positive involvement in planning, execution and running of programmes and to suggest the extent of

such involvement.

d). Selection of sites : to prepare guidelines for selection of sites keeping in view the priorities and involvement of the State Governments regarding allocation of land and capital grant.

2.3. Recommendations :

The Study Group first met at Ahmedabad on July 5, 1979 and after prolonged discussions a broad outline on each of the terms of references was suggested on the basis of which a draft Master Plan was prepared and placed before the second meeting of the Group at Delhi on October 25, 1979 for consideration. Extensive deliberations took place in the second meeting on the draft plan and the study group gave their final recommendations on each of the terms of references based on which this current Master Plan is prepared. The final recommendations of the study group are given in Annexure 'C'.

3. CONCEPT & CONTENTS :

3.1. Purpose of District Science Centres :

The District Science Centres should be developed primarily as activity based learning centres with a view to :

- i) develop scientific attitude and thinking by encouraging curiosity and questioning processes;
- ii) encourage critical analysis of social, cultural, technological and natural environment;
- iii) inculcate an ability to identify the problems and work towards an appropriate solution;
- iv) collect and disseminate information relating to science and technology on demand;
- v) promote and support innovative and experimental activities in pursuit of the purposes of the Centre.

3.2. Areas and Scope of activities :

All District Science Centres should have a common basic core element concentrating on as many of the following subjects :

- i) method of science-incorporating physical, natural and social sciences;
- ii) agricultural sciences with special reference to agricultural technology, soil and water conservation and management, food, fodder and ecology;
- iii) energy, craft and cottage industries;
- iv) health sciences with special reference to social hygiene, preventive measures, family welfare, food and nutrition.

An individual DSC should necessarily not strive on all activities as mentioned above; programmes may be developed based on the available human and other resources and actual needs of the area. Also each individual DSC should emphasise on topics of local variation and relevance in addition to the basic core element so as to help scientific attitude and pattern being assimilated in community life there. For instance, a DSC situated in an agricultural area should specifically be agriculture-oriented; even here there should be provision for variations depending upon the primary crops, farming practices, agroclimatic conditions and ancillary activities like poultry, fisheries etc. Similarly at some other places these could reflect health and hygiene, popular science, industrial growth, natural history, social, cultural, scientific and industrial heritage of the place etc.

3.3. Methods of Presentation :

In general each DSC should primarily concentrate on -

- a) developing temporary/semi-permanent/permanent exhibitions on topics of local and current interest pertaining to advancements in science and technology and their application to kankini ;
- b) developing Childrens' Science Park with open air participatory type scientific exhibits;
- c) strengthening School Science Programmes particularly in rural areas to supplement curriculum teaching of

science in schools, to develop teaching aids and thereby improving the quality of teaching and to develop creative faculties of the children;

d) planning and executing Community Science Programmes through involvement of experts from different fields and organisations on projects having local relevance and necessity;

e) arranging regular audiovisual programmes like scientific film shows, popular lectures with slide projection etc.;

f) arranging outreach programmes like Mobile Science Exhibitions and Mobile Demonstration Programmes carrying general awareness exhibits, teaching aids, adult education kits etc. in rural areas so that the message of science and technology can percolate to the people living in remote villages;

g) organising vocational training programmes for unemployed youths, professionals, school drop-outs, farmers, artisans, housewives, physically handicapped persons etc. on different trades.

3.4. Clientele :

The clienteles for the temporary/semi-permanent/permanent exhibitions, presented to suit an average intellect would be basically the town dwellers and the students. The children would be benefitted from the Science Park. The school Science Programmes would solve the problems of school teachers and students. The clienteles for the Community Science Programmes and Mobile Demonstration Programmes would be basically the non school goers, adults and the villagers. The special programmes undertaken from time to time at the Centres would serve the interest of people from every walks of life in the district.

3.5. Exhibition Halls :

The semi-permanent and permanent exhibition halls in each of the District Science Centres at the first phase should be on a topic of ample local importance i.e. on "Wealth of the District" which would have in itself exhibits on Geology, Geography, Ethnology, Anthropology, Flora and Fauna, Agriculture, Health & Hygiene, Food and Nutrition, Cottage and Small Scale Industries, Heavy Industries etc of the district. This gallery should be

extended further in the second phase to deal with the subject in greater details. The exhibits of this gallery in each District Science Centre may be finally designed from the following broad classifications :

The District in History :

A composite title exhibit comprising of :

- a) Geological and geophysical configuration of the region.
- b) Ethnological aspects.
- c) Evidences of pre-historic and historic material culture, archaeological evidences.
- d) Tribal culture as inherited from pre-Aryan times - folk festivals, dances, masks etc.
- e) The progress of the District in recent advances in science and technology - vis-a-vis its need.

Geography of the District :

This section should deal with the followings :

- a) An animated relief map of the District showing locations of its all important towns, rivers and rivulets, irrigation canals, roads and bridges, railway lines, forests, agricultural land, important industries etc.
- b) Climate of the District - average rainfall, monsoon and dry periods, average temperatures in summer and winter, soil moisture contents, effects of trade winds etc.
- c) Soil characteristics of the District, causes of land erosion and their prevention techniques, reasons and methods of land reclamation, the nature of rivers (seasonal changes and their role in communication and irrigation), hydrological findings etc.

Resources of the District :

This section should deal with the followings :

- a) Man and man-power potential - population of the district, literacy rate, different vocations of the people, labour resources - skilled and unskilled, education - primary, secondary and higher secondary schools, undergraduate colleges, technical and medical institutions, institutions engaged in adult education.
- b) Economic flora and fauna - area of forest (past and present), general nature of the forests (types of trees etc.), afforestation and phased deforestation, effects of flora on environment (soil erosion prevention etc.), forest based industries and their potential in the district, local fauna, protection of endangered specimens (if any), the ecological balance.
- c) Mineral resources - availability of the different minerals and their locations, a mineral map of the district, the uses prevalent and the potential uses of the most important minerals available in the district, mineral based industries (cottage and heavy).
- d) Agriculture - the true picture of agriculture in the district, total available land for cultivation, different crops cultivated, annual production, major and minor irrigation facilities and their future plan, surface and underground water resources, typical problems of agriculture in the district, soil and soil testing, seeds and fertilisers, tools and implements, improved sowing techniques, field irrigation and water management techniques, plant protection methods and devices, insects and pests, post-harvest technology including storage and protection of agricultural produce, crop rotation techniques, ancillary industries like poultry, fishery, animal husbandry etc.
- e) Transport, communication, shelter and power resources - different forms of transport prevalent in the district with typical examples of some past and present forms of transport, present day condition and future improvements in rail, road and water transportations, typical rural houses - their advantages and disadvantages, low cost house building techniques from locally available materials, extent of electrification in the district and its future plan etc.
- f) Industries - existing cottage and small scale industries and their development through ages, the present condition of the industries and their future possibilities. If some typical local industry exists in the district

which is normally not very common in other parts of the country then that has to be elaborately dealt with. Also this section should include industries like sericulture, bee keeping, lac production etc. In addition there should be exhibits on existing and projected heavy industries, thermal power stations etc.

- g) Health & Hygiene - human anatomy - brain, muscle, bone, vein, respiratory system, digestive system, heart and lungs etc. and their functions, common diseases, their cause, prevention and protection, public health and hygiene including vaccination, necessities of inoculation of child, protection against infectious diseases like tuberculosis, malarial, cholera, plague, etc., carriers of infectious diseases and their preventions, first aid including treatments against cut, burn, fracture, snake/insect bite, drowning etc., health care of child and mother, birth of a child and mother's role in it, deterioration of mother's health due to repeated pregnancy, role of health units, number and locations of primary and other health units in the district, general health of the people of the district and their average longevity, ways towards increased longevity and decreased child death, necessities of general cleanliness of the house, clothings, bodies of the members of the family. This section should also deal very elaborately any typical wide spread disease of the district - its symptom, treatment, prevention and control, - rehabilitation of cured patients (if appropriate), local agencies for treatment and rehabilitation etc.
- h) Food & Nutrition - general food habits of the people of the district, ingredients of food, function of nutrients in human body, roles of vitamins and minerals and their availability from the food stuff, balanced diet for children, adolescent boys and girls, adult men and women including pregnant and lactating mother, some common food borne diseases, food preservation techniques, kitchen hygiene including cooking of food and storage of cooked food, role of water in human body, methods of purifying water, potable water resources in the district.

The other permanent/semi-permanent exhibition halls to come up in the second phase will be on "Science in everyday life" and "Exploration and Invention". The temporary exhibitions arranged in each of the centres will be supplied from time to time from its parent museum/centre. Besides there should be spaces earmarked for Auditorium, Lecture Hall (indoor), Creative Ability Centre, Training Hall etc.

3.6. Children Science Park :

This should be a place where heavy and bulky exhibits could be kept in the open for display and operation by the visitors specially by the children. There should be a number of amusing outdoor scientific exhibits in the form of games and sports so that the young visitor finds it engrossing to manipulate them through simple and easy to operate gadgets. The basic idea of such a Park is to help the children to learn through play. Besides each Science Park should have a Life Science Corner where some tender live animals may be kept for display and handling by the children. The idea of such a Life Science Park is to grow love among the children for the animals and help in establishing a symbiotic relationship between man and animals.

The exhibits for each Science Park may be chosen from among the followings along with others. The list is only illustrative and not exhaustive.

- | | | |
|--------|---|---|
| Energy | - | 1. Windmill |
| | | 2. Solar Cooker |
| | | 3. Solar Still |
| | | 4. Bio-Gas Plant |
| | | 5. Solar Home |
| | | etc. etc. |
| Light | - | 1. Semaphore Tower-Optical Telescope |
| | | 2. Peri Telescope |
| | | 3. Camera Obscura |
| | | 4. Bird in the Cage |
| | | 5. Perception of Depth |
| | | 6. Mixing of colours |
| | | 7. Polarisation of Colours |
| | | 8. Strobe Vision |
| | | etc. etc. |
| Sound | - | 1. Musical Pipes |
| | | 2. Musical Bars and String |
| | | 3. Different types of horns |
| | | 4. Propagation of sound through different media |
| | | etc. etc. |

- Geography -
1. Earth Globe
 2. Moon Globe
 3. Mars Globe
 4. Venus Globe

etc. etc.

- Weather
Forecasting -
1. Anemometer
 2. Windvane
 3. Maximum & Minimum Thermometers
 4. Wet and Dry Bulb Thermometer
 5. Rain Gauge - recording and non recording
 6. Sun shine recorder
 7. Open Pan Evaporimeter
 8. Thermohygrograph
 9. Microbarograph

etc. etc.

- Time -
1. Sand Clock
 2. Water Clock
 3. Shadow Clock
 4. Sun Dial

etc. etc.

- Mechanics -
1. Cycloid
 2. Loop-the-Loop
 3. Gravity Paradox
 4. Action & Reaction
 5. Conservation of Angular Momentum
 6. Pulley Block
 7. Swing
 8. Sea Saws
 9. Lissajou's Figure
 10. Incline Plane
 11. Screw Jack
 12. Hydraulic Jack
 13. Gear train to drive a Generator
 14. Gear train to show clock mechanism
 15. Belt drives
 16. Worm Gears

etc. etc.

- Water Body -
1. Water Wheels
 2. Archimedeian Screw
 3. Persian Wheel

etc. etc.

- Civil & Architectural -
1. Hollow Pyramid
 2. Domes - different kinds
 3. Bridges - different types like suspension, rope etc.
 4. Hydraulic Dam
- etc. etc.
- Life Science -
1. Birds
 2. Deer
 3. Monkey
 4. Rabbits
 5. Guinea Pigs
 6. White Mice
 7. Snake
 8. Aquarium - Gold fishes and Black Moli etc.
 9. Pool - Turtles, ducks, fish, etc.
 10. Herbarium
 11. Birds' Restaurant
- etc. etc.

The Science Park garden should be developed in a manner so that it becomes a recreational place for the visitors. There should be sufficient sitting arrangements with fibre glass umbrellas and some litter bins. The plants planted in the garden should not be done haphazardly rather it should be planned according to certain botanical series. In addition, in every Science Park there should be sufficient open space for organising special programmes like Science Fairs, large size Science & Technology Exhibition etc.

3.7. School Science Programme :

In this programme school students would be served with regular Education Extension Programmes like

a) Science Demonstration Lecture - trained Guide Lecturers of the respective Centres will deliver lectures before the school students on various topics on fundamentals of science specially chosen from the school curricula and dealt for an easy understanding through a series of experiments performed before the students. Kits for the purpose will be specially designed and fabricated by the parent museum/centre. This programme

will also help the school teachers to get an idea about the fabrication of teaching aids from scrapped materials. Programming will be done in consultation with Headmasters of the District Schools or the District Inspector of Schools. The lectures may be delivered in the District Science Centre itself or the lecturers may go to the school along with the kit for delivering the lectures.

b) School Loan Service - a number of fabricated kits for performing experiments on subjects covered by the school curriculae will be supplied on loan to the interested schools within the District for helping the teachers in their class room teaching. The kits will be developed by parent museum/centre.

c) Science Quiz Contest - Quiz contest on scientific topics will be conducted annually for the school students of the District. This programme is aimed at making the students more interested and involved in the models and exhibits of the centre where they will examine each one of them carefully and also make studies on scientific subjects covered by the school curriculum. The contest will be held between teams consisting of four students all coming from the same school in a multi-tier system depending upon the number of school participation.

d) Teachers Training Programme - the school science teachers will be involved in the development of class room teaching aids and other useful kits/gadgets from cheap materials. The teachers will also get training to start and run Hobby Centres in their respective schools through this programme.

e) Science Fairs - the school students from all over the District will participate annually in a competitive exhibition with models and exhibits designed and fabricated by them.

f) Science Seminars - school students will be involved in a competition of delivering lectures on scientific topics to be decided by the DSC or the parent museum/centre.

g) Creative Ability Centre - each DSC will have a special hall earmarked for this purpose where school students will be involved throughout the year in developing and fabricating different models and exhibits or pursuing hobbies. The centre personnel will be available for their guidance. In addition the centre will provide the students

with all amenities like working tools, raw materials etc. The projects thus undertaken by the students will be allowed for display in the annual Science Fairs/Camps.

In addition, investigative projects will be undertaken by a team of senior school/college students with a teacher as leader to go for solving some typical local problems or to develop new/improved types of gadgets. For such projects expertise may be available from outside organisations. Some typical examples of the projects may be survey of economic minerals of the district, survey of economic flora and fauna of the district, drinking water survey for the district, improved plan for roads and bridges for the district etc.

3.8. Community Science Programmes :

The programme will be both project oriented and training oriented.

a) Project Oriented Programmes : under this scheme attempts will be made to involve local youths in some investigative projects on local problems under expert guidance from sponsored agencies. This may be long term projects comprising of the following stages :

- i) identification of problem
- ii) preliminary field investigation and submission of report
- iii) study of feasibility by DSC or parent museum/centre authorities
- iv) preparation of working models for the projects for approval and display
- v) actual work entrusted to the implementing agencies.

The youths involved in this project may be given a suitable honorarium depending upon the nature and extent of the job. Their Guide or Expert may also be offered some honorarium. The projects may be of different types like possible method of converting a generally barren land into agricultural field by properly collecting and testing soil samples, land reclamation and suggesting suitable crops to be cultivated there, developing some improved kinds of agricultural tools and implements from the locally available resources, studying and giving solution of any problem for local cottage industries like ceramics, tannery,

blacksmithy, handloom etc., new sources of agricultural water, low cost house building from locally available resources etc. Several such projects will be identified by the respective District Science Centre authorities and selections of the teams of workers to undertake such projects are also to be done by them. Every project need not be conducted at the DSC itself rather some of those may be conducted in some other parts of the District which are most proximate to the problem site. For identification of projects a contest may be conducted in which different persons/organisations will submit project proposals highlighting different problems and proposing a possible solution. The District Science Centre authorities will carefully scrutinise all such proposals and the most relevant ones would be taken up. The necessary tools, equipments and raw materials for undergoing the projects may be supplied by the concerned DSC or some sponsoring agency. Once a project is taken up, this will generally be guided by the Team Leader and the District Science Centre officials who will frequently visit the site for necessary guidance towards implementing the project and also for preparation of the working model. The models thus fabricated will be kept for display in the District Science Centre for some appropriate duration to be decided by the authorities.

b) Training Programmes : this programme will be aimed at imparting job oriented training to unemployed youths, professionals, skilled, semi-skilled and un-skilled workers and artisans, farmers, physically handicapped persons etc. There will be some programme specially for women and housewives. All these training programmes will be organised in collaboration with the appropriate agencies. The role of the District Science Centre will be mainly to provide space and necessary raw materials. Some common machineries and tools may also be provided by the concerned DSC, if necessary. Some typical programmes may be as follows :

- i) tubewell and agricultural pump set repair and maintenance;
- ii) repair and maintenance of tractor and power tiller and other agricultural tools and equipments;
- iii) shoe making;
- iv) food processing and preservation;
- v) nutrition training camp;
- vi) scientific cooking process;
- vii) repair and maintenance of various electrical and electronic equipments/gadgets commonly used by the local people;

viii) glazing of terracotta potteries, etc. etc.

3.9. Mobile Demonstrations :

Programmes for rural population will be conducted in mobile vans specially designed for the purpose with provision for interchangeability of different demonstration units according to the nature of the programmes. The demonstrations would be held outside the van and the equipments, demonstration kits etc. would be re-installed in standard cabinets or casings inside the vehicle body. Programmes such as Mobile Science Library, Training/ Teaching units, Adult Education units, Mobile Hobby Centre, Mobile Science Exhibition etc. will be conducted under this scheme. The design of the vehicle body and the kits/ exhibits will be such that the same standard cabinet or the casing can be used for all the purposes mentioned. The mobile unit will go to the programme site and station there for few days for effective interaction by the people and completion of the programme. The programming for such demonstrations will be done by the District Science Centre authorities in consultation with the concerned local Government agencies, philanthropic bodies, academic institutions and such other organisation. The demonstration van will be suitably designed by parent museums/centres.

INFRASTRUCTURE :

4.1. Land, building and services :

The District Science Centres may have provision for expositional, experimental and recreational facilities in order that they are able to fulfil their objectives. This would mean construction of buildings for exhibition hall, lecture rooms, training halls, laboratories, library and activity centre. Considering the above, followings are the minimum requirement for land and building :

- a) Land : minimum 3 acres (more land would be welcome to organise out-door parks and other activities)
- b) Building : covered area of a maximum of 2000 sq. mt. to be built in two phases.

i) Distribution of areas for different activities in the building

Items

Approx. Area

<u>Items</u>	<u>First phase</u>	<u>Second phase</u>	<u>Total</u>
Display Halls	200	800	1000
Auditorium & Lecture Hall (indoor)	100	-	100
Multipurpose Open Hall (outdoor)	100	-	100
Creative Ability Centre	50	50	100
Training Hall	100	50	150
Library	50	50	100
Small Maintenance Workshop	50	50	100
Office & Store	50	100	150
Visitors facilities (Toilet etc.)	100	100	200
Total -	<u>800</u>	<u>1200</u>	<u>2000</u>

For every District Science Centre building care, must be taken so that the first phase of construction tallies properly with the second and final phase of construction towards its architectural view and utility aspects. It is, therefore, necessary to prepare the complete building plan i.e., of 2000 sq. mts. area right at the initial stage and segregate a self contained portion of 800 sq. mts. area for the first phase of construction. The programme for the building construction work for each District Science Centre may be taken up according to the following sequence :

- a) contour survey/topographic plan of the area
- b) appointment of Architect
- c) preparation of preliminary plan (Master Plan) for the entire building of 2000 sq. mts. area
- d) approval by the employer
- e) identification of the first phase of construction
- f) soil testing, if necessary
- g) detailed plan and design including foundation and superstructure for the first phase of construction
- h) sanction from appropriate authorities
- i) preparation of bill of materials and tender papers and publication of tender notices

- j) scrutiny of tenders and final sanction from appropriate authorities
- k) appointment of Civil Contractor
- l) furnishing detailed drawing for foundation, super-structure etc. by the Architect to the Contractor
- m) drawing for sanitary and plumbing and starting work for the same
- n) side by side running of electrical fitting works
- o) regular supervision of the job by the employer and the Architect
- p) M.B. and payment of bills

While floating tender notices for the building construction, care must be taken to include sanitary and plumbing works along with the civil construction work and tender for the electrical installation work has to be published within two weeks of the publication for the civil and sanitary tenders. This will help in the smooth running of works in the building construction and the installation of services. The architectural plan for the boundary wall, positions of foundation stone, inaugural stone and name of the Centre in two languages, garage for the mobile demonstration van and another diesel van, electric sub-station, pump house, watchmen's goomty, ticket selling booth, car parking area, visitors cycle stands etc. should be made ready along with the first phase of the building. Ceilings of all the exhibition halls are to be painted with deep blue colour keeping at least about 1 foot skirting on the walls. The ceiling fans are also to be painted with dark blue colour. The sanitary and plumbing works should run simultaneously with the building construction and conduit pipes should be used as far as practicable.

Every District Science Centre should have its own drinking water source preferably through tube well. This would be installed at the first phase of construction. If possible pressurised tank may be used for water circulation in the toilets, Creative Ability Centre, Training hall and such other places. If pressurised tanks are not used then location of the water storage tank should be finalised in the first phase of construction so that its shape goes with the architectural plan of the building. Positively the storage tank should have a separate roof so that it is protected in the summer days from exposure to direct sun light. Drinking water tap and toilet areas for the visitors should be so located so that it is done in the first phase of construction.

4.2. Building plans and Layout of Science Parks for District Science Centres at Purulia and Gulbarga are attached in Annexure 'D'.

4.3. Services :

a) Each Centre should have 400 volts, 3 phase, a.c. connection for the following peak load :

<u>Peak Electrical Load</u>			
<u>(in KVA)</u>			
<u>Items</u>	<u>First Phase</u>	<u>Second Phase</u>	<u>Total</u>
Display Hall	6	24	30
Auditorium (including forced air ventilation and fans)	6	-	6
Open Hall, Park, Outdoor area	10	-	10
CAC & Training Hall	3	3	6
Library, Workshop & Office	3	6	9
Visitors facilities	2	2	4
Total	<u>30</u>	<u>35</u>	<u>65</u>

b) Emergency Power Supply (if required)

<u>Elements</u>	<u>Required KVA</u>
Emergency Lights	1.0
Fans in office, library, Workshop and auditorium	1.0
Projector in auditorium	0.5
Skeleton power supply in Workshop for urgent repairs etc.	0.5
Skeleton power in exhibition halls	5.0
Total	<u>8.0</u>

c) To meet the above and some other unforeseen emergency power requirements a diesel generator set of 10 KVA capacity may be installed in the first phase, if emergency supply is required.

c) Telephone Connection : one external telephone under category - PLAN 104 with intercommunication facilities i.e. one master and two extensions would be provided in each of the centres.

d) Fire fighting equipments : there will be 8 nos. of foam type rechargeable fire fighting equipments installed at important locations in the building of each DSC. Other fire fighting provisions like sand and water etc. would also be kept in the premises in sufficient quantity. A long fire hose connected to the main water pump should be preserved properly.

All electrical conduits are to be laid during construction. In every 2.5 meter square floor area in the Exhibition Halls there will be one power point for the exhibits. 16 gauge 1" conduits are to be used with circular junction box. Telephone conduits are to be drawn from the main reception to the general office and District Science Officers room. There should be sufficient electric points at the ceilings of specially the exhibition halls for light and fan. Sufficient conduits are to be laid for light, fan and power points in the ceiling. Forced air ventilation should be provided at the auditorium. Conduits are to be laid from the main reception to all the Exhibition Halls for the public address system.

4.4. Equipments and tools :

4.4.1. Mechanical

- i) Wolf Hobby sets
- ii) Bench drill with stand $\frac{1}{2}$ "
- iii) Circular saw
- iv) Fret saw
- v) Bench grinder, polishing, buffing with flexible shaft
- vi) Gun drill $\frac{1}{4}$ " - 3 Nos.
- vii) Vacuum cleaner with suction

4.4.2. Electrical and Electronics

- i) Megger
- ii) Meters

- iii) Transistor
- iv) C.R.O.
- v) Audio O.S.C.
- vi) P.A. System
- vii) Radio
- viii) Power packs - various types
- ix) Transformer - various types

4.4.3. Display and Drawing

- i) Artist's work table - 1 No.
- ii) Spray gun for Artist's (small) - 1 No.
- iii) Air compressor with air storage tank (small) - 1 No.
- iv) Leroy type lettering set (one English & Hindi) - 1 + 1 Nos.
- v) Drawing board - 1 No.
- vi) Instrument box and sets - 1 Set

4.4.4. Education and Information

- i) 16 m.m. movie projector - 2 Nos.
- ii) Super 8 movie projector - 1 No.
- iii) 35 m.m. slide projector (one manual and one automatic) - 1 + 1 Nos.
- iv) Overhead projector - 1 No.
- v) Cassette tape recorder - 2 Nos.
- vi) 35 m.m. Camera with accessories - 1 No.

4.4.5. Office

- i) Duplicating machine - 1 No.
- ii) Type writer - 2 Nos.
- iii) Electronic calculator (desk type) - 1 No.
- iv) Miscellaneous furniture

4.5. Vehicles :

- i) One diesel jeep, preferably four wheel drive, for carrying out field trips, inspection, film shows, soil testing etc. throughout the district, - to be purchased in 1st phase.
- ii) One diesel van, specially designed, to carry out mobile demonstration - to be purchased in 2nd phase

4.6. Man-power :

- a) For effective coordination among all District

Science Centres, the following staff pattern is recommended by the Study Group for the central planning unit located in the NCSM Headquarters. Their primary job will be to plan, support and monitor the activities of various District Science Centres.

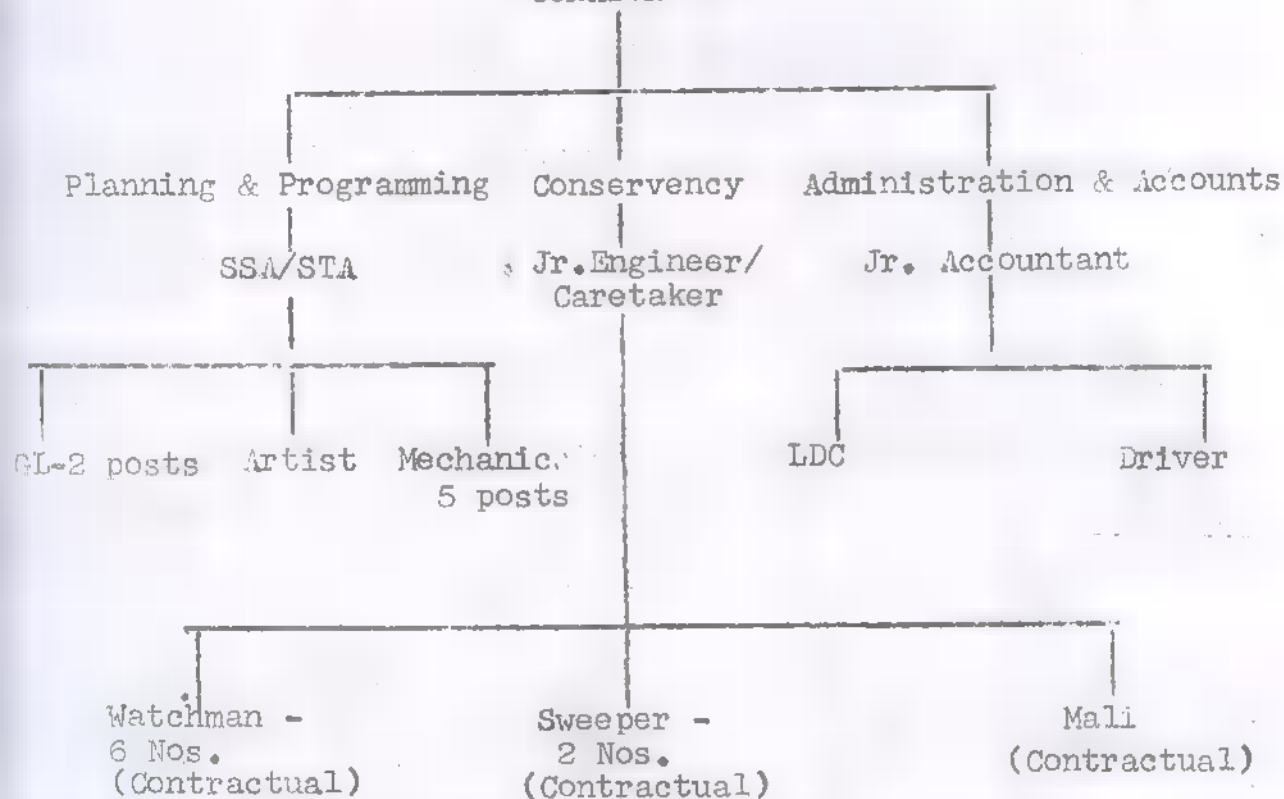
Curator 'C' - (Rs. 1100 - 1600)	- 1 post
Curator 'B' - (Rs. 700 - 1300)	- 2 posts
Sr. Scientific Assistant (Rs. 550 - 900)	- 2 posts
Exhibition Officer (Rs. 700 - 1300)	- 1 post
Junior Stenographer (Rs. 330 - 560)	- 1 post

b) The staff pattern in each District Science Centre must be conducive to their becoming self-reliant in organising activities and programmings on their own. The supporting exhibits shall however be supplied from parent museum/centre or collaborating agencies. Considering above, the following staff is recommended in each individual DSC when fully developed.

Curator 'B' - (Rs. 700 - 1300)	- 1 post
SSA/STA (Rs. 550 - 900)	- 1 post
Jr. Accountant (Rs. 425 - 700)	- 1 post
Jr. Engineer-cum-Caretaker (Rs. 425 - 700)	- 1 post
L.D.C. (Rs. 260 - 400)	- 1 post
Driver (Rs. 260 - 400)	- 1 post
Mechanic (Rs. 380 - 560 or Rs. 260 - 350)	- 3 posts
Artist (Rs. 380 - 560 or Rs. 260 - 350)	- 1 post
G.L. (Trainee)	- 2 posts

The Senior staff to be recruited should have appropriate background in basic sciences/engineering/biological sciences/agricultural sciences/agronomy/science communication and have managerial capability and ability to deal with the people in rural areas. They should have definite commitment to the cause of the District Science Centres and innovativeness and creative ability in the past. The incumbents in the Caretaker post may have background in the fields of life sciences like horticulture, botany, zoology, etc. so that they will be able to manage the life science park and the garden.

The NCSM shall introduce traineeship with appropriate allowances for different categories of people to be recruited for the District Science Centres so that their capabilities and attitude towards such activities can be assessed before offering regular appointments.

Manpower Table for each DSC***CURATOR 'B'**

*The Curator 'B' shall be designated as District Science Officer whenever he will be placed in charge of a District Science Centre.

The personnel for District Science Centres must be recruited well in advance and must be provided with purposeful training in the NCSM units as well as other centres like VASCS, Ahmedabad, HBSC, Bombay, BITS, Pilani, etc.

4.7. Financial input :

On the basis of the land available for each of District Science Centre free of cost from the respective State Governments the following will be the capital and annual expenditure in respect of land development, building construction, models and equipments, etc. in two phases :

Capital expenses during set up

	<u>Ist phase</u>	<u>2nd phase</u>	<u>Total</u>
1. Buildings & Services -	12.00	20.00	32.00
2. Exhibits & Equipments -	3.25	10.50	13.75
3. Vehicles -	0.75	1.50	2.25
Total -	16.00	32.00	48.00

Annual expenses

	<u>Ist phase</u>	<u>2nd phase</u>	<u>Total</u>
1. Salaries & Allowances -	1.00	1.00	2.00
2. Contingencies -	1.00	1.00	2.00
3. Consumable stores -	0.40	0.60	1.00
4. Books & Films* -	0.10	0.15	0.25
(capital)			
Total -	2.50	2.75	5.25

*Films shall mostly be borrowed from present museum/NCERT/ State Govt. and other sources. The DSC will have a small collection of films.

About 50% of the Capital expenditure towards the building is expected to be available from the respective State Governments and other local agencies.

Break up of Annual Expenses

Figures in lakhs of Rupee

(Figures in lakhs of Rupee)

Salaries & Allowances for the entire Staff	....	1.00
Contingencies	....	1.00
Developmental Activities	....	<u>0.50</u>
Total :		2.50

Details of Contingencies

Watch & Ward	....	0.25
Garden & Sweeper	....	0.20
Electricity/Telephone	....	0.10
Vehicle - Diesel and Repair	....	0.20
Stationeries & Printing	....	0.05
Miscellaneous	....	<u>0.20</u>
Total :		1.00

Details of Developmental Activities

Educational Extension Activities	....	0.20
Community Programmes	....	0.20
Repair of models & Exhibits	....	<u>0.10</u>
Total :		0.50

5. Planning & management :

5.1. Organisation :

The Task Force set up by the Planning Commission in 1973 in its recommendations suggested to establish three types of Science Museums/Centres in the country with the following responsibilities.

Type 'A'

These would be large size Museums/Centres like those in Calcutta, Bangalore and Bombay and would be established in cities with population over 8 lakhs. Their functions would be planning, exhibits development including fabrication to meet their own requirements and also for other Museums/Centres, recruitment and training of personnels for all types of science Museums/Centres, research and development of techniques towards design and fabrication of models and exhibits and programming of activities. Each of these Museums/Centres would be developed ultimately as national centres comparable to similar institutions in scientifically developed countries. The infra-structure recommended for each one of them are as follows :

- a) Land - minimum 10 acres;
- b) Building - total area 20000 sq. mt. which would include display halls, library, planetarium, lecture hall, workshop, stores, etc.;
- c) Financial input - Rs. 130.00 lakhs as capital and Rs. 9.00 lakhs as annual recurring expenditure;
- d) Man-power - 30 persons in scientific cadre, 80 persons in technical cadre and 30 persons in administrative cadre making a total of 140 persons.

Type 'B'

These would be medium size State level Regional Science Museums/Centres like the one coming up at Patna and would be established in cities with population between 3 and 8 lakhs. The functions of these museums/centres will be planning and programming of its own activities and

exhibits development to meet its own requirements. The infra-structure recommended for each one of them are as follows :

- a) Land - minimum 5 acres .
- b) Building - total area 9000 sq. mt. including display hall, library, workshop, stores, etc.
- c) Financial input - Rs. 50.00 lakhs as capital and Rs. 5.00 lakhs as annual recurring expenditure
- d) Man-power - 15 persons in scientific cadre, 30 persons in technical cadre and 18 persons in administrative cadre making a total 63 persons

Type 'C'

These would be small Museums/Centres at the District level (District Science Centres) and would be established in places having population below three lakhs. This type of museums/centres will be responsible for planning and programming of its own activities. They will be developed as satellite around a particular Type 'A' or Type 'B' museum/centre. Although both Type 'B' and Type 'C' museums/centres would be dependent upon the Type 'A' museums/centres for recruitment and training of personnel and development of techniques, the Type 'C' museums/centres would be entirely dependent upon the Type 'A' museums/centres for supply of all kinds of exhibitions. The infra-structure recommended for each one of them are as follows :

- a) Land - minimum 1 acre;
- b) Building - total area 2000 sq. mt. including display hall, library, auditorium, maintenance workshop, etc.;
- c) Financial input - Rs. 18.00 lakhs as capital and Rs. 3.00 lakhs as annual recurring expenditure;
- d) Man-power - 8 persons in scientific cadre, 18 persons in technical cadre, 9 persons in administrative cadre making a total of 35 persons.

5.2. Collaboration :

The District Science Centres will assume the role of an organisor for various programmes through the involvement of the local people and relevant agencies. They should develop linkages with the relevant local institutions engaged in rural upliftment and services of experts from such institutions should be availed of. They should also get the involvement into its programme and activities of local authorities and experts in various fields and a Local Advisory Committee be set up for each District Science Centre for formulating its programmes.

In general the State Governments should have active involvement in each District Science Centre in terms of giving free land and sharing capital expenditure of about 50% and by way of recurring grants for various community science programmes and school science programmes.

In addition, collaboration from the following agencies as identified below may be sought.

- a) Vikram A Sarabhai Community Science Centre, Ahmedabad
- b) Kishore Bharti, Hoshangabad
- c) Homi Bhabha Centre for Science Education, Bombay
- d) Murugappa Chettier Research Centre, Madras
- e) Vigyan Shiksha Kendra, Banda
- f) Assam Science Society, Gauhati
- g) Kerala Shastriya Sahitya Parishad
- h) Nehru Yuvak Kendra
- i) Adult Education Dept. of Ministry of Education
- j) State Departments of Youth Services
- k) Rotary Club, Lions Club, etc
- l) Philanthropic and Missionary Organisations
- m) Agricultural Universities
- n) Krishi Vigyan Kendras

5.3. Selection of site :

The Study Group recommended that out of the 20

District Science Centres, the first two must be at Purulia in West Bengal and Gulbarga in Karnataka. The NCSM may select in consultation with the respective State Governments the sites for the remaining three centres out of the following five backward regions identified :

- a) Kanniyakumari or Ramanathapuram or Tinnevely in Tamil Nadu
- b) Ahmednagar region in Maharashtra
- c) Banaskantha or Sabarkantha or Panchmahal in Gujrat
- d) One district in Nagaland to be selected by the State Government
- e) Banda or Hamirpur in Bundelkhand area marked as the border between Uttar Pradesh, Madhya Pradesh and Rajasthan.

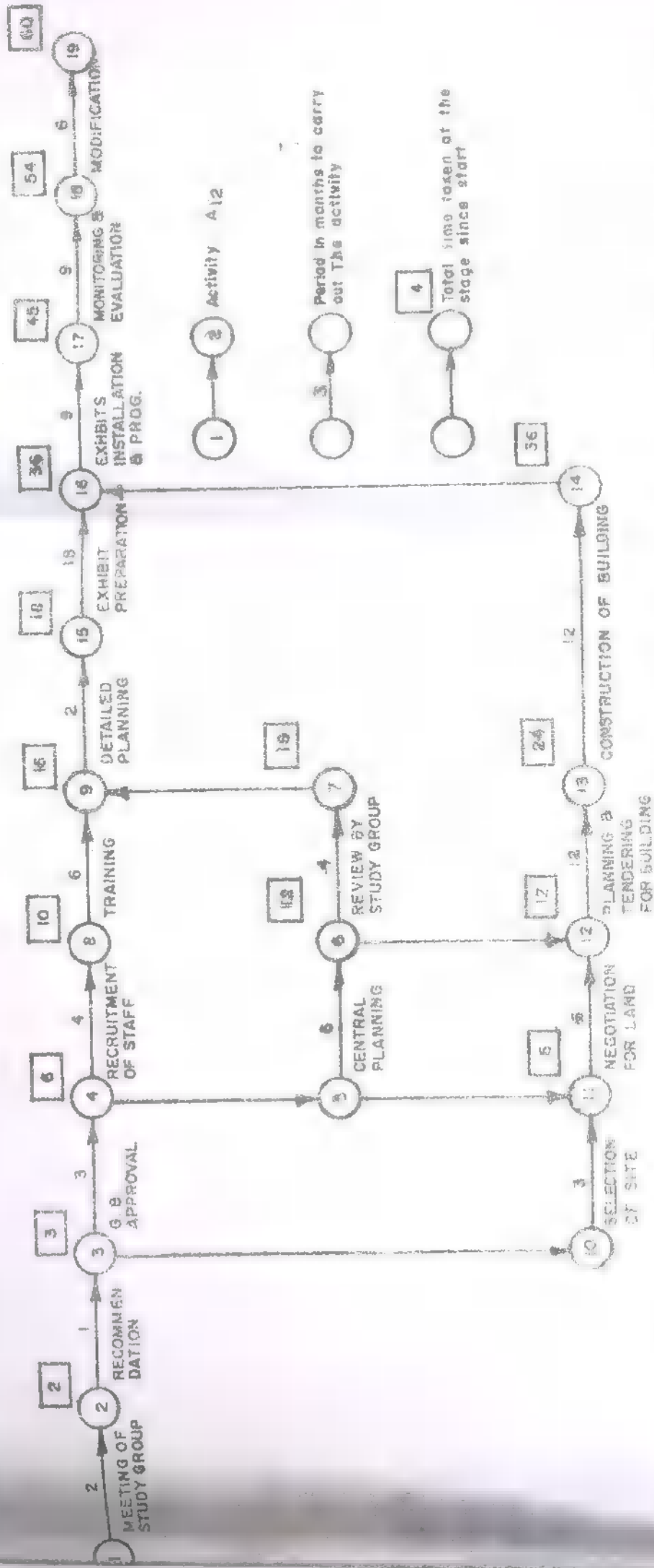
5.4. Schedule of work :

A CPM (Critical Path Method) Chart has been prepared for setting up of each District Science Centre so that the work could be undertaken and monitored as per a predetermined schedule. The clarification of individual activities in the chart (page 32) is given below :

- A 12 - The Study Group for the particular DSC should meet several times to outline the detailed requirements of the Centre which will include suggestions for specific locations for establishment of the Centre, different activities to be undertaken by the particular Centre, the broad subjects of the exhibition halls etc.
- A 23 - The recommendation of the Study Group should be prepared in consultation with its Chairman.
- A 34 - The recommendations of the Study Group should be got approved by the Governing Body of the NCSM.
- A 48 - The NCSM will recruit at least the Senior Personnel to be posted at the particular DSC.

NATIONAL COUNCIL OF SCIENCE MUSEUMS

CHART FOR PLANNING AND DEVELOPMENT OF DISTRICT SCIENCE CENTRES



TOTAL LEAD TIME FROM START ① TO INAUGURATION OF D. S. C. ①7 IS 45 MONTHS

- A 89 - The appointed personnel for the DSC will receive intensive training at the NCSM Headquarter or at the collaborating agencies or at the parent Museum/Centre or at all places.
- A 56 - The Central Planning Unit at NCSM Headquarters will take up the job of preparation of a detailed draft master plan for the particular DSC which will include selection of exhibits for the Science Park, detailed theme of the individual exhibits in permanent/semi-permanent exhibition halls, detailed space requirements for different activities in the building etc.
- A 67 - The Study Group should meet as many times as required to examine the draft master plan prepared by the NCSM and the final master plan is to be prepared by incorporating the recommendations and modifications suggested by the Study Group at this stage.
- 10-11 - Pending approval of the Governing Body the NCSM should finally select a particular plot of land within the areas earmarked by the Study Group for establishment of the particular DSC.
- A 11-12 - After receiving approval of the Governing Body the parent Museum/Centre will start negotiation for physical possession of the plot of land selected for the purpose of establishment of the DSC and the NCSM Headquarters will complete registration of deed of the particular land.
- A 12-13 - The parent Museum/Centre will appoint an Architect for construction of the building and preparation of the layout of Science Park. The Architect will work as per guidance provided in the draft master plan prepared by the NCSM Central Planning Unit and the preliminary drawing of the building should be got approved by the Executive Committee of the parent Museum/Centre. All formalities towards preparation of the NIT should be made ready within this stipulated period and tender notices for construction should be published in this period.

- A 13 - 14 - During this period the work order to the civil and electrical contractors are to be issued and the 1st phase of the construction of the building should be finished in all respects.
- A 9 - 15 - During this period detailed planning and fabrication drawings for each individual exhibit should be taken up and also completed. The staff for the DSC concerned who have been recruited and trained so far will be fully involved from now on in all the activities.
- A 15 - 16 - Fabrication of exhibits for Science Park as well as exhibition halls will be taken up at this stage by the parent museum/centre. All the exhibits planned and designed so far should be completed in all respects during this period. The equipments for training hall., CAC, Office, Library, etc will also be procured at this stage.
- A 16 - 17 - Installation of exhibits in the DSC exhibition halls as well as in the Science Park will start. Installation of machineries, equipments, furniture etc will also be done at this stage. In addition, various activity oriented programmes will also be taken up from now on. The formal inauguration of the DSC will be done at the end of this period.
- A 17 - 18 - The Monitoring and Evaluation Cell of the NCSM Headquarters will take up the job of total evaluation of the work done during the period after regular functioning of the DSC. They will prepare a comprehensive report about the changes/modifications necessary in regard to exhibition halls, Science Park, different education extension community science programmes etc.
- A 18 - 19 - The modifications suggested by the Monitoring and Evaluation Cell will be implemented at this stage.

5.5. Monitoring & Evaluation :

All exhibits and activities of DSC shall be organised (i) with well-defined objectives and (ii) for clearly identifiable target groups. A generalised and vague

objective is bound to confuse and misguide the District Science Officer himself than anybody else. Without a clear objective it would be extremely difficult to compare the results of pre-test and post-test which are necessary for correct evaluation. The test data, after being suitably processed, will indicate the deviation from the objective and the target. This deviation or "error" should be taken care of in mending up the deficiencies of the existing programmes and in planning of further activities. The process of evaluation shall be continuous so that the "error" can be minimised in stages by alternate monitoring, evaluation and corrections. Monitoring and evaluation shall be performed in the following three areas :

- i) Monitoring of performances vis-a-vis physical targets as indicated in the Annual Plan and Five Year Plan - shall be undertaken twice a year.
- ii) Demographic Survey and behavioural study of the Target groups for various exhibitions and activities - shall be a continuous programme.
- iii) Evaluation of exhibits and activities vis-a-vis their objectives - shall be a continuous programme.

Monitoring can be done either by structured questionnaires or through various observational methods. Use of simple gadgets in the form of participatory games is often attractive and more effective in the process of evaluation.

6. Conclusion :

The Task Force recommended setting up of twenty District Science Centres spread all over the country. In view of limited resources the Study Group suggested establishment of five centres in the first phase. The first two centres will be at Purulia and Gulbarga and the rest three centres will be set up at any three of the five backward regions identified by the Study Group. The final selection of sites will be done by the NCSM after examining the availability of suitable plots of land and the extent of local interest shown by various agencies particularly the respective State Governments. About the rest fifteen centres although there was no specific recommendation by the Study Group but the general feeling was that for establishment of any further DSC the priority must be given to the

backward places. It is also necessary to ensure that the centres are ultimately established in a fairly distributed manner all over the country.

The functions of the District Science Centres will be somewhat different from those of the existing large Museums/Centres. Most of the programmes taken up by the District Science Centres will have to be result-oriented. Instead of banking heavily on the conventional temporary/semi-permanent/permanent exhibitions the Centres will emphasise more on different activity-oriented programmes. The Study Group therefore felt that the success of the centres rest almost exclusively on the selection of proper personnel at the senior level who shall have to be committed to the purpose of such centres. They also recommended that the centres should enjoy adequate autonomy in financial and administrative matters for organising activities within the stipulated budget. Each District Science Centre will have a Local Advisory Committee for formulation of programmes. The central museum/centre to which such District Science Centres will be attached will provide adequate support by lending exhibits and equipment and by offering necessary training facilities. The central museum/centre will also help in working out inter-DSC collaborative projects on subjects of common interest.

The District Science Centre shall be a dynamic organisation not only through organising various activity-oriented programmes to meet the requirements of the local populace but also it shall have a regular system of monitoring and evaluation for all its programmes and activities based on which the centre shall continually change its activities and programmes including exhibitions.

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A N N E X U R E

Report
of the
TASK FORCE ON SCIENCE
MUSEUMS

Education Division
Planning Commission
GOVERNMENT OF INDIA
New Delhi-110 001.

NOVEMBER 1973

INTRODUCTION

1.0. It is well recognised that one of the most powerful means for transforming our society is provided by the advances in and the application of science and technology. Two sets of initiatives are necessary in this regard : one relating to plans and programmes of scientific research and technological development oriented towards socio-economic goals and the other to create and promote a scientific temper and a scientific climate in the country which would make it possible for the society to assimilate technical innovations in the pattern of living. The educational system could play a significant role in both these aspects : among its objectives are the education of future manpower resources for research and development, the participation in R&D efforts dependent upon the competences, resources and potential available in institutions of higher education and the dissemination and diffusion into the community of the benefits and possible uses of science.

1.1. Creation of scientific temper and development of scientific attitude should appropriately start with children, particularly those in primary and secondary schools. It helps the children to absorb, appreciate and inculcate the habits of science easily and effectively. It also contributes to the process of education encouraging children to think rationally and inquisitively.

1.2. The approach to develop the scientific attitude in children could be two-fold : through a proper system of science education in schools and by exposing children to "science" in the environment around them in a meaningful way. Attempts are being made in the country to strengthen and improve of science education by modernising the curricula, including science subjects in the core programme, provision of laboratory facilities and training of science teachers. In addition, there is need to demonstrate science and its applications as a dynamic aspect of modern life and as part of the basic purpose of the society. This latter objective could be achieved by using the visual medium of science museums. In order to make a beginning in this regard, the Planning Commission has proposed that a scheme be formulated for the setting up of science museums in the Fifth Plan.

1.3. There is a variety of issues to be considered in regard to the establishment of science museums as proposed. For example, if the museums are to make the expected impact in as short a time as possible then they would have to be related, both in terms of the number of museums to be set up and in the types of exhibits to be arranged in them, to the number, the level of knowledge and the nature of environment of the children who would be the primary beneficiaries; perhaps, the minimum